

## THE ADVANCED TECHNICAL MATERIALS FOR NOISE MITIGATION IN BUILDINGS AND IN THE ENVIRONMENT

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### **ABSTRACT.**

In the last three decades, significant research effort has been dedicated to the study of technical materials obtained by the careful arrangement of “acoustic” elements with the aim of achieving enhanced acoustic characteristics, sometimes beyond the behaviour of materials found in nature. These are usually named as acoustic metamaterials and they present peculiar features due to the way wave propagation phenomena is controlled. A global perspective of the recent advances in the development of acoustic metamaterials will be presented, illustrating different groups of acoustic solutions and their main effects.

On the other hand, the use of different numerical methods and recent additive manufacturing techniques are valuable engineering tools in the recent study and development of acoustic materials and assembled systems. Therefore, a set of acoustic problems will be discussed where the numerical modelling, in the scope of Civil Engineering applications, has played an important role in the enhancement of the acoustic properties of different acoustic materials and systems. The implementation of combined or hybrid numerical methods and the use of advanced numerical formulations has allowed to efficiently and accurately improve noise mitigation characteristics of acoustic systems based on metamaterials concepts.